WO 2005/030947 PCT/EP2004/052353

52

CLAIMS

1. A method of diagnosing or prognosticating a neurodegenerative disease in a subject, or determining whether a subject is at increased risk of developing said disease, comprising determining a level and/or an activity of

- (i) a transcription product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (ii) a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1 and/or
- (iii) a fragment, or derivative, or variant of said transcription or translation product,

in a sample obtained from said subject and comparing said level and/or said activity to a reference value representing a known disease or health status, thereby diagnosing or prognosticating said neurodegenerative disease in said subject, or determining whether said subject is at increased risk of developing said neurodegenerative disease.

- 2. The method according to claim 1 wherein said neurodegenerative disease is Alzheimer's disease.
- 3. The method according to claims 1 and 2 wherein said cytosolic sulfotransferase family 4A member 1 is the cytosolic sulfotransferase family 4A member 1 splice variant 1 and/or the cytosolic sulfotransferase family 4A member 1 splice variant 2.
- 4. A kit for diagnosing or prognosticating a neurodegenerative disease, in particular Alzheimer's disease, in a subject, or determining the propensity or predisposition of a subject to develop such a disease by the steps of:
- (i) detecting in a sample obtained from said subject a level, or an activity, or both said level and said activity of a transcription product and/or of a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and (ii) comparing said level or activity, or both said level and said activity of a transcription product and/or of a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1 to a reference value representing a known health status and/or to a reference value representing a known disease status, and said level, or activity, or both said level and said activity, of said transcription product and/or said translation product is varied compared to a

reference value representing a known health status, and/or is similar or equal to a reference value representing a known disease status, said kit comprising:

- a) at least one reagent which is selected from the group consisting of (i) reagents that selectively detect a transcription product of a gene coding for a cytosolic sulfotransferase family 4A member 1 and (ii) reagents that selectively detect a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1.
- 5. A method of treating or preventing a neurodegenerative disease, in particular Alzheimer's disease, in a subject comprising administering to said subject in a therapeutically or prophylactically effective amount an agent or agents which directly or indirectly affect an activity and/or a level of
- (i) a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (ii) a transcription product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (iii) a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (iv) a fragment, or derivative, or variant of (i) to (iii).
- 6. A genetically altered non-human animal comprising a non-native gene sequence coding for a cytosolic sulfotransferase family 4A member 1, or a fragment, or a derivative, or a variant thereof.
- 7. The genetically altered non-human animal according to claim 6 wherein said non-human animal is a mammal, preferably a rodent, more preferably a mouse, a rat or a guinea pig, or an invertebrate animal, preferably an insect, more preferably a fly such as the fly *Drosophila melanogaster*.
- 8. The genetically altered non-human animal according to claims 6 and 7, wherein the expression of said genetic alteration results in said non-human animal exhibiting a predisposition to developing symptoms, and/or displaying symptoms of neuropathology similar to a neurodegenerative disease, in particular symptoms similar to AD.
- 9. The genetically altered non-human animal according to claims 6 and 7, wherein the expression of said genetic alteration results in said non-human animal which

has a reduced risk of developing symptoms similar to a neurodegenerative disease, in particular a reduced risk of developing symptoms similar to AD and/or which shows a reduction of AD symptoms and/or which has no AD symptoms due to an effect caused by the expression of the gene used to genetically alter said non-human animal.

- 10. Use of the genetically altered non-human animal according to claims 7 to 9 for screening, testing, and validating compounds, agents, and modulators in the development of diagnostics and therapeutics to treat neurodegenerative diseases, in particular Alzheimer's disease.
- 1 1. An assay for screening for a modulator of neurodegenerative diseases, in particular Alzheimer's disease, or related diseases or disorders of one or more substances selected from the group consisting of
- (i) a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (ii) a transcription product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (iii) a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (iv) a fragment, or derivative, or variant of (i) to (iii), said method comprising:
- (a) contacting a cell with a test compound;
- (b) measuring the activity and/or level of one or more substances recited in (i) to (iv);
- (c) measuring the activity and/or level of one or more substances recited in (i) to (iv) in a control cell not contacted with said test compound; and
- (d) comparing the levels and/or activities of the substance in the cells of step
 (b) and (c), wherein an alteration in the activity and/or level of substances in the contacted cells indicates that the test compound is a modulator of said diseases or disorders.
- 12. A method of screening for a modulator of neurodegenerative diseases, in particular Alzheimer's disease, or related diseases or disorders of one or more substances selected from the group consisting of
- (i) a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or

- (ii) a transcription product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (iii) a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1, and/or
- (v) a fragment, or derivative, or variant of (i) to (iii), said method comprising:
- (a) administering a test compound to a test animal which is predisposed to developing or has already developed symptoms of a neurodegenerative disease or related diseases or disorders in respect of the substances recited in (i) to (iv);
- (b) measuring the activity and/or level of one or more substances recited in (i) to (iv);
- (c) measuring the activity and/or level of one or more substances recited in (i) or (iv) in a matched control animal which is predisposed to developing or has already developed symptoms of a neurodegenerative disease or related diseases or disorders in respect to the substances recited in (i) to (iv) and to which animal no such test compound has been administered;
- (d) comparing the activity and/or level of the substance in the animals of step(b) and (c), wherein an alteration in the activity and/or level of substances in the test animal indicates that the test compound is a modulator of said diseases or disorders.
- 13. The method according to claim 12 wherein said test animal and/or said control animal is a genetically altered non-human animal which expresses the gene coding for a cytosolic sulfotransferase family 4A member 1, or a fragment, or a derivative, or a variant thereof, under the control of a transcriptional control element which is not the native a cytosolic sulfotransferase family 4A member 1 gene transcriptional control element.
- 14. An assay for testing a compound, preferably for screening a plurality of compounds for inhibition of binding between a ligand and a cytosolic sulfotransferase family 4A member 1 protein, or a fragment, or derivative, or variant thereof, said assay comprising the steps of:
- adding a liquid suspension of said a cytosolic sulfotransferase family 4A member 1 protein, or a fragment, or derivative, or variant thereof, to a plurality of containers;

WO 2005/030947 PCT/EP2004/052353

56

- (ii) adding a compound or a plurality of compounds to be screened for said inhibition of binding to said plurality of containers;
- (iii) adding a detectable ligand, in particular a fluorescently detectable ligand, to said containers;
- (iv) incubating the liquid suspension of said a cytosolic sulfotransferase family 4A member 1 protein, or said fragment, or derivative, or variant thereof, and said compound or compounds, and said ligand;
- (v) measuring amounts of detectable ligand, of preferably fluorescence associated with said a cytosolic sulfotransferase family 4A member 1 protein, or with said fragment, or derivative, or variant thereof; and
- (vi) determining the degree of inhibition by one or more of said compounds of binding of said ligand to said a cytosolic sulfotransferase family 4A member
 1 protein, or said fragment, or derivative, or variant thereof.
- 15. The use of protein molecules of SEQ ID NO. 1 and/or SEQ ID NO. 2, said protein molecules being a translation products of the gene coding for a cytosolic sulfotransferase family 4A member 1, or fragments, or derivatives, or variants thereof, as diagnostic targets for detecting a neurodegenerative disease, preferably Alzheimer's disease.
- 16. The use of protein molecules of SEQ ID NO. 1 and/or SEQ ID NO. 2, said protein molecules being translation products of the gene coding for a cytosolic sulfotransferase family 4A member 1, or fragments, or derivatives, or variants thereof, as screening targets for reagents or compounds preventing, or treating, or ameliorating a neurodegenerative disease, preferably Alzheimer's disease.
- 17. Use of an antibody specifically immunoreactive with an immunogen, wherein said immunogen is a translation product of a gene coding for a cytosolic sulfotransferase family 4A member 1, SEQ ID NO. 1 or SEQ ID NO. 2, or a fragment, or derivative, or variant thereof, for detecting the pathological state of a cell in a sample obtained from a subject, comprising immunocytochemical staining of said cell with said antibody, wherein an altered degree of staining, or an altered staining pattern in said cell compared to a cell representing a known health status indicates a pathological state of said cell which relates to a neurodegenerative disease, preferably to Alzheimer's disease.